

## CLAIMS

- 1    1.    A reconfigurable ball bat comprising:  
2            a center tube including a handle portion;  
3            a barrel assembly comprising:  
4                  a transition piece;  
5                  an end cap;  
6                  a barrel removably connected to the end cap at a distal end of the barrel,  
7    the barrel connected to the transition piece at a proximal end of the barrel; and  
8            wherein the barrel assembly is removably supported as a unit on the center tube by  
9    the transition piece and the end cap.
- 1    2.    The reconfigurable ball bat of claim 1, further comprising:  
2            an end plug having a body in a form of a shaft and a head connected to the body;  
3            the body fixed in a distal end of the center tube; and  
4            the head protruding from the distal end of the center tube and engaged with the  
5    end cap.
- 1    3.    The reconfigurable ball bat of claim 2, further comprising:  
2            an elongate slot in the end cap;  
3            the head having an elongate configuration; and  
4            wherein the head fits into the slot in an interlocking relation.
- 1    4.    The reconfigurable ball bat of claim 3, further comprising at least one anti-rotation  
2    fitting inserted in the elongate slot and holding the head in the interlocked relation against  
3    rotation.
- 1    5.    The reconfiguration ball bat of claim 4, wherein the at least one anti-rotation  
2    fitting is held in the elongate slot by a set screw engaging the anti-rotation fitting and the  
3    end plug.

- 1    6.     The reconfigurable ball bat of claim 2, further comprising:  
2           an opening in the end cap for receiving the center tube therethrough;  
3           wherein the head of the end plug is larger than the opening in the end cap and  
4 cannot pass through the end cap so that the end cap is mounted on the center tube by  
5 passing the end cap over a proximal end of the center tube with a knob removed.
- 1    7.     The reconfigurable ball bat of claim 6, further comprising:  
2           a threaded element on the center tube;  
3           a nut for engagement with the threaded element;  
4           wherein the barrel assembly including the end cap is passed over the proximal end  
5 of the center tube and moved distally until the end cap engages the head of the end plug;  
6           the barrel assembly is held in place on the center tube by the nut after the barrel  
7 assembly and the nut have been moved distally over the center tube.
- 1    8.     The reconfigurable ball bat of claim 6, wherein the head further comprises a non-  
2 circular structure engaged with structure in the end cap to prevent relative rotational  
3 movement between the end cap and the end plug.
- 1    9.     The reconfigurable ball bat of claim 1, further comprising a ballast supported on  
2 at least one of the end cap and the transition piece.
- 1    10.    The reconfigurable ball bat of claim 9, wherein:  
2           each of the end cap and transition piece has a engagement structure; and  
3           the ballast engages the engagement structure on each of the end cap and the  
4 transition piece.
- 1    11.    The reconfigurable ball bat of claim 1, further comprising a ballast, wherein the  
2 ballast is concentric with and is disposed within the barrel.

- 1    12.    The reconfigurable ball bat of claim 10, wherein:  
2            the ballast has a tubular configuration; and  
3            the ballast is disposed between the barrel and the center tube.
- 1    13.    The reconfigurable ball bat of claim 1, wherein the barrel has an inner diameter of  
2    approximately two inches and an outer diameter of approximately two and a quarter  
3    inches.
- 1    14.    The reconfigurable ball bat of claim 1, wherein the barrel comprises a  
2    thermoplastic material.
- 1    15.    The reconfigurable ball bat of claim 14, wherein the barrel comprises a  
2    polycarbonate material.
- 1    16.    The reconfigurable ball bat of claim 14, wherein the barrel comprises a  
2    polyurethane material.
- 1    17.    The reconfigurable ball bat of claim 16, wherein the barrel comprises a  
2    reinforcing material.
- 1    18.    The reconfigurable ball bat of claim 1, wherein the center tube has an inner  
2    diameter in a range from approximately .500 inch to approximately .715 inch.
- 1    19.    The reconfigurable ball bat of claim 1, wherein the center tube has an outer  
2    diameter in a range from approximately .75 inch to approximately 1.00 inch.
- 1    20.    The reconfigurable ball bat of claim 1, wherein the center tube comprises an  
2    aluminum material.
- 1    21.    The reconfigurable ball bat of claim 1, wherein the center tube comprises a  
2    composite material.

- 1 22. The reconfigurable ball bat of claim 21, wherein the center tube comprises an  
2 aluminum inner portion and a reinforcing fiber outer layer.
- 1 23. The reconfigurable ball bat of claim 1, wherein the center tube comprises a  
2 thermoplastic material.
- 1 24. The reconfigurable ball bat of claim 1, wherein the center tube is fiber reinforced.
- 1 25. The reconfigurable ball bat of claim 1, wherein:  
2 the end cap and the transition piece have respective bearing surfaces with  
3 respective minimum diameters; and  
4 the barrel is a straight cylindrical barrel and engages the end cap and the transition  
5 piece at a diameter greater than or equal to the respective minimum diameters.
- 1 26. The reconfigurable ball bat of claim 1, further comprising a ballast located  
2 interiorly of the barrel to provide a predetermined weight along a length of the barrel.
- 1 27. The reconfigurable ball bat of claim 26, wherein the ballast seals an inner surface  
2 of the barrel and surrounds the center tube.
- 1 28. The reconfigurable ball bat of claim 1, wherein the barrel assembly is removably  
2 mounted and is removable as a unit.
- 1 29. The reconfigurable ball bat of claim 1, wherein:  
2 the barrel assembly further comprising a ballast disposed within the barrel; and  
3 the ballast is a non-strengthening member for adding a predetermined weight so  
4 that the reconfigurable ball bat weighs less than or equal to 30 ounces.
- 1 30. The reconfigurable ball bat of claim 29 wherein the bat weighs less than or equal  
2 to 28 ounces.

1 31. The reconfigurable ball bat of claim 29, wherein the bat weighs less than or equal  
2 to 26 ounces.

1 32. The reconfigurable ball bat of claim 29, wherein the bat has a weight in a range  
2 from 22 ounces to 24 ounces.

1 33. The reconfigurable ball bat of claim 29, wherein the bat meets the standards of the  
2 NCAA for ball bats.

1 34. The reconfigurable ball bat of claim 29, wherein the bat meets the standards of the  
2 ASA for ball bats.

1 35. The reconfigurable ball bat of claim 29, wherein:  
2 the barrel assembly is a first barrel assembly; and  
3 the ball bat further comprises at least one additional barrel assembly so that the  
4 ball bat includes a plurality of barrel assemblies that are selectively and removably  
5 mounted on the center tube.

1 36. The reconfigurable ball bat of claim 35, wherein the plurality of barrel assemblies  
2 have a predetermined variety of weights or playability characteristics.

1 37. The reconfigurable ball bat of claim 1, wherein the transition piece comprises two  
2 connectable parts joined together.

1 38. The reconfigurable ball bat of claim 37, wherein the two parts comprise a  
2 generally frustoconical part and a radially extending part supporting the frustoconical part  
3 in a coaxial configuration relative to the center tube.

1     39.     A reconfigurable ball bat kit, comprising:  
2             a barrel assembly including:  
3                 a barrel;  
4                 an end cap adapted to be supported on the barrel;  
5                 a transition piece adapted to be supported on the barrel and removably  
6 supported on a handle portion of the ball bat; and  
7                 a ballast adapted to be supported on the end cap and on the transition piece  
8 inside the barrel.

1     40.     The reconfigurable ball bat kit of claim 39, wherein the ballast is coaxial with the  
2 barrel in an assembled state.

1     41.     The reconfigurable ball bat kit of claim 39, wherein the ballast has a  
2 predetermined weight.

1     42.     The reconfigurable ball bat kit of claim 40, wherein:  
2             the end cap has a distal engagement structure;  
3             the transition piece has a proximal engagement structure, and  
4             the ballast is supported at a distal end and at a proximal end by the distal  
5 engagement structure and the proximal engagement structure respectively in an  
6 assembled state.

1     43.     The reconfigurable ball bat kit of claim 39, wherein the ballast is fixed to each of  
2 the distal engagement structure and the proximal engagement structure.

1     44.     The reconfigurable ball bat kit of claim 39, wherein the ballast is a thin film  
2 tubular member having a thickness in a range from ten to one hundred and twenty-five  
3 thousandths of an inch.

1     45.     The reconfigurable ball bat kit of claim 39, wherein:  
2             the barrel assembly is a first barrel assembly; and  
3             the reconfigurable ball bat kit further comprising a plurality of barrel assemblies  
4     including the first barrel assembly.

1     46.     The reconfigurable ball bat kit of claim 45, wherein each of the plurality of barrel  
2     assemblies has a different weight and/or a different playability characteristic from at least  
3     another of the barrel assemblies.

1     47.     The reconfigurable ball bat kit of claim 39, wherein the transition piece comprises  
2     two connectable parts adapted to be joined together.

1     48.     The reconfigurable ball bat kit of claim 47, wherein the two parts comprise a  
2     generally frustoconical part and a radially extending part for supporting the frustoconical  
3     part in a coaxial configuration relative to the center tube.

1     49.     A method of using a reconfigurable ball bat, the bat having a center tube and a  
2     barrel assembly removably mounted on the center tube, the barrel assembly comprising a  
3     transition piece, an end cap, a barrel, and a ballast, the method of using the reconfigurable  
4     ball bat comprising selecting the barrel assembly in accordance with a desired weight  
5     and/or playability of the barrel assembly.

1     50.     The method of using of claim 49, wherein the ball bat comprises a plurality of  
2     barrel assemblies in which the barrel assembly is a first barrel assembly; the method of  
3     using further comprising selecting a barrel assembly from among the plurality of barrel  
4     assemblies based on a desired weight and playability.

1     51.     The method of using of claim 50, further comprising a preliminary step of  
2     assembling at least one of the barrel assemblies.

1 52. The method of using of claim 49, further comprising supporting the barrel  
2 assembly on the center tube.

1 53. The method of using of claim 52, further comprising inserting the central tube  
2 through the barrel assembly and twisting the center tube relative to the barrel assembly.

1 54. The method of using of claim 53, further comprising:  
2 inserting at least one anti-rotation fitting into the end cap; and  
3 securing the anti-rotation fitting in the end cap by a set screw.

1 55. The method of using of claim 52, further comprising securing the barrel assembly  
2 on the center tube by engaging a blocking nut on the center tube and abutting the  
3 transition piece with the nut.

1 56. A method of making a reconfigurable ball bat, the method comprising:  
2 performing preliminary steps of assembling a barrel assembly, the preliminary  
3 steps including:  
4 connecting a transition piece to a proximate end of a barrel;  
5 connecting a proximal end of a ballast to an engagement structure of the  
6 transition piece;  
7 connecting a distal end of the ballast to a engagement structure of an end  
8 cap; and  
9 connecting an end cap to a distal end of the barrel; and  
10 supporting the barrel assembly on a center tube by inserting the center tube  
11 through the transition piece, the ballast, and the end cap.

1 57. The method of claim 56, wherein the step of supporting further comprises:  
2 inserting the center tube through the transition piece before inserting the center  
3 tube through the ballast and the end cap; and  
4 inserting the center tube through the ballast before inserting the center tube  
5 through the end cap.



- 1    58.    The method of claim 56, further comprising:  
2            a preliminary step of fixing an end plug in a distal end of the center tube; and  
3            connecting the end plug to the end cap.
- 1    59.    The method of claim 58, wherein the step of connecting the end plug to the  
2    end cap comprises interlocking the end plug with the end cap.
- 1    60.    The method of claim 59, wherein the step of interlocking further comprises:  
2            inserting the end plug through the end cap; and  
3            twisting the center tube and end plug approximately ninety degrees.
- 1    61.    The method of claim 59, wherein the step of connecting the end plug to the end  
2    cap further comprises securing the end plug in an interlocked position with at least one  
3    anti-rotation fitting and at least one set screw.
- 1    62.    The method of claim 59, wherein the step of connecting the end plug to the end  
2    cap further comprises securing the end plug in an interlocked position with at least two  
3    anti-rotation fittings and at least two set screws.
- 1    63.    The method of claim 58, wherein the step of connecting the end plug to the end  
2    cap further comprises:  
3            abutting the end cap on an enlarged head of the end plug; and  
4            holding the end cap and the enlarged head in abutting relation by engaging a  
5    proximal end of the barrel assembly with a nut.
- 1    64.    The method of claim 56, wherein the step of supporting further comprises:  
2            inserting the center tube through the end cap before inserting the center tube  
3    through the ballast and the transition piece; and  
4            inserting the center tube through the ballast before inserting the center tube  
5    through the transition piece.

1 65. The method of claim 56, further comprising the steps of:  
2 screwing a nut on a sleeve to hold the transition piece against movement in a  
3 proximal direction after the step of supporting; and  
4 connecting a knob at a proximal end of the center tube.

1 66. The method of claim 56, further comprising the step of assembling the transition  
2 piece from two pieces.

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